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ENHANCED DISPLAY FEATURE FOR NOTEBOOK LID OPEN/CLOSE

HP INC

Enhanced Display Feature for Notebook Lid Open/Close

Abstract: An Enhanced Display feature resolves lid close/open issues across different GPU's display during BIOS post.

This disclosure relates to the field of portable computers.

A technique is disclosed that resolves lid close/open issues across different GPU's display during BIOS post.

Some mobile workstation notebook computers have an Enhanced Display feature to provide a visible image on an attached display. In general, the integrated GPU (iGPU) is the display adapter during BIOS post. Once the lid is closed and there's a display attached to the discrete GPU (dGPU), the dGPU will be the display adapter. However, closing and opening the lid is not supported across the GPU's display during BIOS post. Another problem is the Intel VGA driver yellow bang issue that occurs in a Win10 legacy boot when the dGPU is determined as the display adapter.

According to the present disclosure, and as understood with reference to the Figure, an improved Enhanced Display feature is provided. During BIOS post, the BIOS can change HDMI and the DP Mux IC dynamically to detect the presence of an external flat panel (EFP) and determine the correct display routing.

A 3-stage process during BIOS post changes the display routing behavior. Stage 1 occurs after the system is powered on, at 10. At 20, the BIOS routes the HDMI Mux and 2 DP Mux to dGPU as the default. The BIOS also checks the HPD (Hot-Plug detection) signal via a GPIO pin to see if there's any EFP attached to dGPU.

At Stage 2, when the HPD signal is active at 30 before showing the notebook logo at 50, at 40 the BIOS routes the HDMI Mux and 2 DP Mux from dGPU to iGPU, and then sets the iGPU as the display adapter. This makes all display ports available in the BIOS setup menu.

At Stage 3, when the enhanced display is active at 60 and before booting to the ACPI BIOS at 80, the BIOS routes HDMI Mux and 2 DP Mux from iGPU to dGPU at 70. Because iGPU is always a display adapter, the Intel VGA driver yellow bang problem is avoided. The high resolution display still can be driven by the dGPU in the OS.

The disclosed technique advantageously makes all external flat panels available during BIOS post in Hybrid Graphics mode to support lid switching (i.e. lid close/open). The Intel display adaptor is selected as the primary display adapter in legacy mode even during system boot with the lid closed, so that the Intel VGA driver yellow bang problem is avoided. As a result, the user gains the benefit of a Hybrid Graphics design in the OS as the dGPU is still driving the high resolution display.

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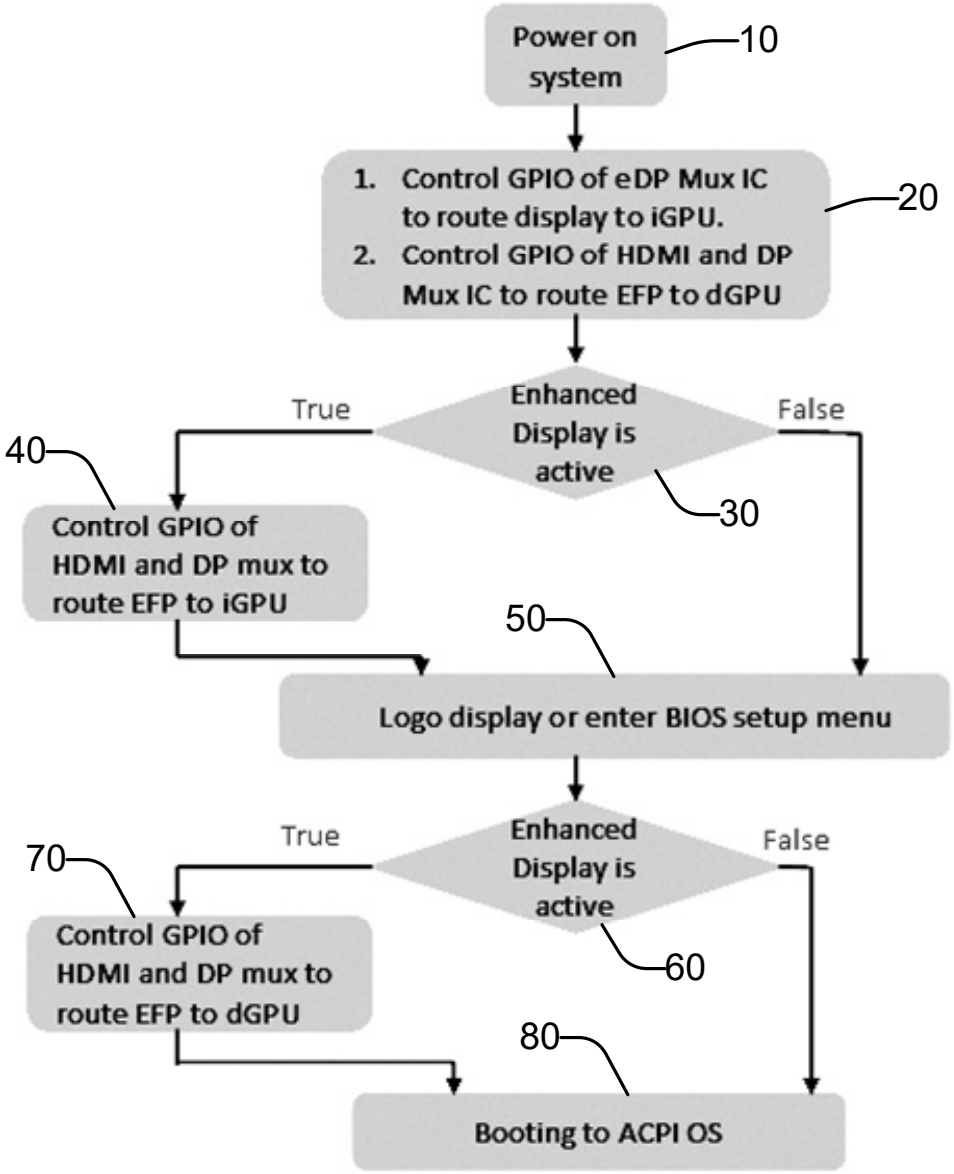
Power on system
10
1. Control GPIO of eDP Mux IC to route display to iGPU.
2. Control GPIO of HDMI and DP Mux IC to route EFP to dGPU
20
Enhanced Display is active
30
True
False
40
Control GPIO of HDMI and DP mux to route EFP to iGPU
50
Logo display or enter BIOS setup menu
Enhanced Display is active
60
True
False
70
Control GPIO of HDMI and DP mux to route EFP to dGPU
80
Booting to ACPI OS